

Historic, archived document

Do not assume content reflects current
scientific knowledge, policies, or practices.

192
CSA
UNITED STATES DEPARTMENT OF AGRICULTURE

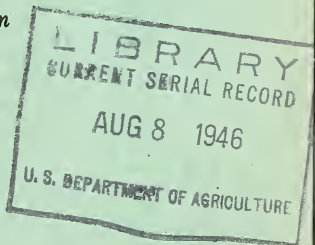
✓ SOIL CONSERVATION SERVICE

WASHINGTON, D. C.

SOIL CONSERVATION DURING THE WAR

By George W. Collier

Conservation Economics Section



✓ WAR RECORDS MONOGRAPH - 2

March, 1946

WAR RECORDS MONOGRAPHS

The War Records Project of the United States Department of Agriculture, assigned to the Bureau of Agricultural Economics in 1943, is part of a Government-wide project, initiated by President Roosevelt and coordinated by the Bureau of the Budget, to record the history of the Government's activities in World War II. The objectives of the Departmental project have been to collect, organize and preserve the basic records of wartime administration and to prepare histories of the major war programs. These histories will be issued as War Records Studies.

To supplement the studies of major programs a series of monographs has been planned to present in greater detail the wartime changes in various sectors of agriculture. These supplementary accounts are being issued as War Records Monographs either by the Bureau of Agricultural Economics or by other agencies in this Department.

Below is a list of the War Records Monographs published or in press.

No. 1 - Farm Machinery and Equipment, by
Erling Hole

No. 2 - Soil Conservation During the War,
by George W. Collier.

War Records Monograph No. 2 is published by the Soil Conservation Service.

SOIL CONSERVATION DURING THE WAR

George W. Collier 1/

CONTENTS

	<u>Page</u>
Introduction.....	1
Rate of Soil Loss During the War.....	2
Effects of Changed Land Use.....	2
Increased Use of Conservation Practices.....	4
Rainfall Intensity.....	8
Wartime Changes in Soil Conservation Service Policies	11
Agricultural Conservation Program of Agricultural	
Adjustment Agency.....	13
Postwar Prospects for Soil and Water Conservation....	17
Needed Land Use Changes and Effects on	
Production.....	17
Conservation Needs in the United States.....	19
Soil Conservation District Organization and	
Development.....	21
Summary.....	25

INTRODUCTION

Considerable interest has been shown in the problem of soil loss during the war period. Many people have wondered as to the price we paid for necessary war production in terms of impaired soil resources. On the other hand, an increased use of soil conservation practices helped to make that record war production possible. The influence of some factors during the war period has improved our present conservation status while at the same time it has deteriorated in other respects. The present task is to consider both kinds of factors which have affected the rate of progress toward the achievement of soil conservation objectives. Some of them are not necessarily direct war effects but may have merely happened to occur during that period.

1/ Head, Conservation Economics Section, Research, Soil Conservation Service, in collaboration with other members of the Soil Conservation Service and other agencies of the United States Department of Agriculture. Special acknowledgement should be made of the assistance of R. E. Uhland, Soil Conservation Service, in the interpretation of soil loss data and of James M. Hunt, Jr., of the Agricultural Adjustment Agency for the use and interpretation of data from that Agency.

Some may ask if the conservation objective itself may not have been changed by the war. Surely an increased war production was necessary even though more exploitive land uses were involved in its attainment. However, many cropping practices which are conducive to the saving of soil also tend to increase production. The relative emphasis of changed land use versus the more extensive use of conservation practices has varied considerably with the war needs for specific kinds of agricultural products. However, one statement of the general objective of soil conservation activities has remained unchanged - namely, the production of crops, livestock, and livestock products without unnecessary loss or wastage of soil and water resources.

RATE OF SOIL LOSS DURING THE WAR

The average rate of soil loss which has occurred during the war period has been dependent on three principal factors as follows:

- (1) The acreage and sequence of intertilled crops and other uses of land in relation to the characteristics of the land on which crops were grown.
- (2) The extent of use of conservation practices within a specific land-use pattern.
- (3) The relative amount and intensity of rainfall during the period.

Effects of Changed Land Use.--In an attempt to measure the effect of war-time use of cropland on soil loss, without considering the other factors for the moment, Table 1 shows the changed proportionate use of cropland in the two-year period 1943-44 in comparison with the five years 1935-39. The total acreage of cropland for the United States as a whole has remained practically unchanged. In fact, it shows a decline of a fraction of one per cent. Slight increases in total cropland took place in six of the regions shown in Table 1. The largest increase of about 5 per cent was in the Pacific Coast States. A considerable decrease in total cropland occurred in the Southeast with smaller reductions in the Northeast and the Plains States. This situation of slight change in acreage of cropland during the war is in contrast to World War I when crop acreage increased by 8 per cent between 1914 and 1918.

Although the total acreage of cropland changed but little, a more intensive use was made of cropland than in the prewar period. For the United States as a whole, intertilled crops increased about 5 per cent. The Corn Belt with a 16 per cent increase in intertilled crops accounted for a large share of this increase. Intertilled crops increased from 43 per cent of the cropland in the Corn Belt in 1935-39 to 50 per cent during the war years. With a reduced acreage of cotton the Southeast and Mississippi Delta States had about 11 per cent less intertilled crops than in the prewar period.

Table 1.--War-Time Changes in Use of Cropland by Geographic Divisions, 1943-44
as Compared with 1935-39 Average 1/

Region <u>2/</u>	Intertilled		Close-growing		Hay and rotation pasture <u>3/</u>		Summer fallow and idle		Total
	1935-1939	1943-1944	1935-1939	1943-1944	1935-1939	1943-1944	1935-1939	1943-1944	1943-1944
	Per cent of 1935-39 cropland								
Northeast.....	19.7	21.0	21.0	19.3	47.7	46.4	11.6	11.0	97.7
Lake States.....	25.5	29.8	38.7	34.1	28.8	31.7	7.0	6.1	101.7
Corn Belt.....	43.2	50.2	27.0	21.9	23.7	23.6	6.1	4.5	100.2
Appalachian.....	45.6	47.8	11.5	12.0	27.7	31.3	15.2	10.4	101.5
Southeast.....	76.2	68.5	6.1	9.1	3.0	4.1	14.7	11.3	93.0
Mississippi Delta	76.3	68.1	5.9	9.2	6.5	8.7	11.3	14.2	100.2
Southern Plains..	54.4	55.5	27.2	24.6	5.4	5.6	13.0	12.5	98.2
Northern Plains..	23.7	25.8	54.6	55.3	6.8	7.8	14.9	10.0	98.9
Mountain.....	18.0	18.4	33.7	36.9	20.3	20.7	28.0	25.3	101.3
Pacific.....	11.6	14.1	39.5	41.1	18.5	22.5	30.4	27.1	104.8
United States....	38.2	40.2	31.2	30.1	17.2	18.4	13.4	11.0	99.7

1/ Unpublished data, Bureau of Agricultural Economics, United States Department of Agriculture

2/ Northeast - N. Eng. States, N.Y., N.J. and Pa.
 Lake States - Minn., Wis., and Mich.
 Appalachian - Del., Md., Va., W.Va., N.C., Ky., and Tenn.
 Corn Belt - Ohio, Ind., Ill., Iowa, and Mo.
 Southeast - S.C., Ga., Fla., and Ala.
 Mississippi Delta - Miss., Ark., and La.
 Southern Plains - Okla., and Texas
 Northern Plains - N.Dak., S.Dak., Nebr., and Kans.
 Mountain - Mont., Wyo., Idaho, Utah, Nev., Colo., Ariz., and N.Mex.
 Pacific - Wash., Oreg., and Calif.

3/ All tame hay except soybean, cowpea, peanut and small grain.

The acreage of hay and rotation pasture, exclusive of the non-sod-forming types of hay such as soybeans and cowpeas, increased by 7 per cent, although it still occupies less than one-fifth of the total cropland. Slight increases in hay and pasture were characteristic of most regions of the country. Outside of the Southeast and Mississippi Delta States where the increased proportion of hay and rotation pasture is still less than 10 per cent of the acreage of cropland, the greatest percentage increases were in the Pacific, Appalachian, and Lake States with increases of 22, 13 and 10 per cent, respectively.

The increased acreage of intertilled crops and of hay and rotation pasture was accomplished without increasing the total acreage of cropland for the country as a whole, by reducing the acreage in "close-growing crops" by 3 to 4 per cent and by an 18 per cent reduction in idle or summer fallow land. In the Corn Belt and Lake States the rather large increased acreages of intertilled crops came largely from the reduced acreage of small grain.

The change in soil loss per acre of cropland that could be expected to be associated with the changed use of cropland in 1943 and 1944 as compared with the prewar period 1935 to 1939 is shown in Table 2. Rates of soil loss based upon extensive erosion measurements of Soil Conservation Experiment Stations distributed over the United States are estimated for the four use classifications of cropland for the ten geographic regions, and applied to the extent of changed use of cropland shown in Table 1. These estimates do not reflect the differences in use of conservation practices or amount and intensity of rainfall which occurred during the war period.

While the rate of soil loss indicated by land use changes has been considerably reduced in the Southeast and Mississippi Delta States, the average for the country as a whole shows an increase of 3.4 per cent over the prewar years. The Corn Belt and Lake States with a greatly increased acreage of corn and soybeans make the largest contribution to this average loss rate with increases of 11 and 8 per cent, respectively, in those regions. This estimate assumes the same soil loss per acre for a specified use of land in a region. If the sequence of crops also were considered, and a higher soil loss were attributed to corn following corn than if it followed sod crops or small grain, a somewhat greater increase would be indicated, especially in the Corn Belt.

The estimated absolute rates of soil loss of something over 10 tons per acre per year are subject to revision as data for more precise estimates become available. Most significance is attached to the ratio of soil loss rates for the specified uses of land in the various regions in the prewar and war periods.

Increased Use of Conservation Practices.—The estimated 3.4 per cent increase in soil loss per year on cropland during the war period should be adjusted for increased use of conservation practices during that time. The organization of Soil Conservation Districts was just getting well under way at the beginning of the war period. Table 3 shows that the number of organized Soil Conservation Districts increased over 7 times between September 1939 and June 1945. In 1939 only Regions II and IV had more than 25 Districts each while at the present time, four regions (II, III, IV, and V) have more than 200 Districts each (see Table 3).

Table 2.-Annual Soil Loss Per Acre by Kind of Land Use, and Average Soil Loss from Cropland, 1935-39 and 1943-44 (not adjusted for increased use of conservation practices or differences in rainfall)

Region 1/	Use of land				All cropland				
	Inter-tilled crops	Close-growing crops	Hay and rotation pasture	Idle and fallow	1935-1939 per acre	1943-1944			
						Per acre	Per cent of 1935-39		
							Soil loss per acre	Crop-land acre-age	Total soil loss
	Tons	Tons	Tons	Tons	Tons	Tons	Pct.	Pct.	Pct.
Northeast.....	10	4	0.4	2	3.23	3.35	103.7	97.7	101.3
Lake States.....	20	5	0.5	3	7.39	7.87	106.5	101.7	108.3
Corn Belt.....	30	6	0.6	4	14.97	16.66	111.3	100.2	111.5
Appalachian.....	30	8	0.8	6	15.73	15.94	101.3	101.5	102.8
Southeast.....	25	9	0.9	6	20.51	20.06	97.8	93.0	91.0
Mississippi Delta	20	8	0.8	6	16.46	15.25	92.6	100.2	92.8
Southern Plains..	18	4	0.4	4	11.42	11.71	102.5	98.2	100.6
Northern Plains..	10	2	0.2	3	3.92	4.05	103.3	98.9	102.2
Mountain.....	6	3	0.3	5	3.55	3.49	98.3	101.3	99.6
Pacific.....	16	6	0.3	9	7.02	6.90	98.3	104.8	103.0
U. S. Average									
1935-39.....	21.6	4.0	0.5	4.7	10.21				
1943-44.....	21.7	4.0	0.5	5.0		10.59	103.7	99.7	103.4

1/ See Table 1 for States included in geographic regions.

Table 3.-Number of Organized Soil Conservation Districts, 1939 and 1945, by States and Regions

State and region	September 15, 1939	June 15, 1945	State and region	September 15, 1939	June 15, 1945
Delaware.....	-	3	Arkansas.....	16	42
Maine.....	-	8	Louisiana.....	12	17
Maryland.....	3	18	Oklahoma.....	27	66
New Jersey.....	4	4	Texas.....	-	112
New York.....	-	25			
Pennsylvania.....	4	6	Region IV....	55	237
Rhode Island.....	-	3			
Vermont.....	-	5	Kansas.....	2	49
West Virginia.....	-	13	Montana 1/.....	-	41
			Nebraska.....	8	58
Region I.....	11	85	North Dakota.....	7	39
Alabama.....	3	12	South Dakota.....	5	37
Florida.....	1	31	Wyoming.....	-	13
Georgia.....	16	24			
Kentucky.....	-	56	Region V.....	22	237
Mississippi.....	11	51			
North Carolina....	9	20	Arizona.....	-	21
South Carolina....	7	21	Colorado.....	7	55
Tennessee.....	-	28	New Mexico.....	6	48
Virginia.....	5	19	Utah.....	10	33
Region II.....	52	262	Region VI....	23	157
Illinois.....	2	58	California.....	-	38
Indiana.....	-	22	Idaho.....	-	14
Iowa.....	-	55	Nevada.....	7	9
Michigan.....	2	24	Oregon.....	-	10
Minnesota.....	3	26	Washington.....	-	22
Missouri.....	-	14			
Ohio.....	-	32	Region VII...	7	99
Wisconsin.....	10	38			
Region III....	17	269	UNITED STATES..	187	1,346

1/ Includes 18 Grass Conservation Districts.

The use of conservation practices has been greatly facilitated within the last five or six years by the rapid organization of Soil Conservation Districts together with the activities of the Soil Conservation Service in cooperation with other agencies outside of Districts. A tentative estimate of the reduction in soil loss due to the increased use of major conservation practices is made in Table 4. The estimated reduction in soil loss per acre attributed to each practice is made in consideration of conditions in those parts of the country where the practice was most common. For this reason the figures in Table 4 should not be used to indicate the relative or absolute value of specific practices in saving soil in any one location or region. 1/

1/ Interpretation of soil loss data from Soil Conservation Experiment Stations largely by R. E. Umland of the Research Division of Soil Conservation Service.

The entire cropland was considered in estimating per acre savings of topsoil. For instance, the 7 tons saved per acre by contour tillage and terracing is based on 16 tons per acre for that portion of the increased terraced acreage in intertilled crops and about 2 tons per acre for the portion in close-growing and sod crops. A greater than average proportion of the strip-cropping and crop residue management is practiced in the Plains States. Hence, the average estimate for these practices is lower than would be typical in the humid area with greater precipitation. It is estimated that at least one-half of the increase in strip cropping consists of wind strips or non-contour field strips.

Table 4.-Reduction in Soil Loss by Increased Use of Conservation Practices in 1944 Over 1939

Conservation practice	Increased use in 1944 over 1939	Reduction in soil loss	
		Per acre	Total
	<u>Thousand acres</u>	<u>Tons</u>	<u>Thousand tons</u>
Contour tillage and terracing.....	3,500	7	24,500
Contour tillage alone.....	6,800	3	20,400
Terracing alone.....	700	4	2,800
Strip cropping.....	3,500	2	7,000
Crop residue management.....	7,700	2	15,400
Legume cover crops.....	2,500	3	7,500
TOTAL.....			77,600

The estimated annual saving of 77.6 million tons amounts to 0.18 ton per acre on the 425 million acres of cropland in the United States and reduces the average loss per acre shown in Table 3 to 10.41 tons, or 102.0 per cent of the average for 1935 to 1939. It is probable that unreported practices which are important only locally or regionally, together with miscellaneous increased usage of conservation practices for which figures are not available, would increase the estimated saving of soil to a point which would reduce by one-half the increase in soil loss attributed to more intensive land use during the war period. Even with the increased use of conservation practices, this would leave the soil loss rate in 1944 about 1.7 per cent greater than in the 1935-39 period.

Rainfall Intensity.-The actual soil loss during the war period depends, of course, on the degree of normality of precipitation during that period, as well as on the kind of land use and conservation practices in effect. Erosion measurements show that soil losses bear a closer relationship to the rate at which the rain falls (intensity) than to the total rainfall. Therefore, the normality of rainfall effects on soil loss is measured more accurately by the number of rains above a minimum intensity than by the total inches per year. At Statesville, North Carolina from 1931 to 1938, the 17 per cent most intense rains caused 52 per cent of the soil loss from the bare-fallow plot during that period. Table 5 shows that the most intense rains as indicated by the 5-minute maximum rates cause many times more soil loss than the rains of low intensity. The rains with 5-minute maximum intensities of more than 3 inches per hour caused more than 30 times as much soil loss as the rains of less than 1.5 inches per hour at Hays, Kansas and more than 14 times as much at Statesville, North Carolina.

Table 5.-Soil Loss from Rains of Specified Maximum Intensities for 5-Minute Periods, Causing Runoff

Maximum rainfall for five minutes	Continuous kafir plot, Hays, Kansas, 1930 to 1938		Bare-fallow plot, Statesville, North Carolina, 1931 to 1938	
	Rains causing runoff	Soil loss per acre per rain	Rains causing runoff	Soil loss per acre per rain
<u>Inches per hour</u>	<u>Number</u>	<u>Tons</u>	<u>Number</u>	<u>Tons</u>
0 to 1.4	14	.07	151	.38
1.5 to 2.9	21	.36	77	2.56
3.0 to 4.4	23	2.57	32	5.54
4.5 and over	8	5.68	14	6.76

While considerable variation existed in the number of intense rains in specific years in the various regions, the regions contributing most to agricultural production had a larger number of intense rains during the war period than during the years preceding the war and probably more than normally would be expected. For instance, 21 weather stations in the Corn Belt from 1941 to 1944 averaged 11.7 hourly periods per year with rainfall more than 0.4 inch per hour. This compares with only 10.1 such periods from 1936 to 1939. This indicates that an even greater soil loss per acre of cropland was incurred during the war period than would be indicated by the changed uses of cropland

The average number of hours of rainfall above a specified minimum intensity at nine weather stations in the northern part of the Corn Belt and twelve stations in the southern part of Corn Belt States are shown in Table 6 for individual years since 1936. A precipitation of 0.4 inch or more in an hour was selected as the criterion of intense rainfall. More hours of rainfall exceeding this intensity occurred in 1938 than in any other year listed. However, the other four years prior to 1941 were below the nine-year average for this measure of frequency of intense rainfall. All of the years from 1941 to 1944 were above average in this respect for the Corn Belt as a whole. The northern part of the Corn Belt had about 5 per cent more hours of intense rainfall and the southern part about 10 per cent more than the nine-year average. The former figure would more nearly reflect rainfall intensity in the most productive part of the Corn Belt.

Table 6.-Hours of Intense Rainfall in the Northern and Southern Portions of the Corn Belt, by Years, 1936 to 1944 ^{1/}

Item	Nine northern Corn Belt weather stations	Twelve southern Corn Belt weather stations	Total, 21 stations in Corn Belt
	Hours of intense rainfall per year		
Average, 1936-44..	9.0	12.2	10.8
	Per cent of 1936-44 average		
Year:			
1944.....	95	110	105
1943.....	120	108	112
1942.....	100	111	107
1941.....	105	111	109
1940.....	70	63	66
1939.....	84	100	95
1938.....	144	130	135
1937.....	103	87	93
1936.....	78	79	79
1941-44 average...	105	110	108
1936-40 average...	96	92	93

^{1/} An hour of intense rainfall is defined as one hour with 0.4 inch or more of rainfall. The northern weather stations include those north of the Iowa-Missouri boundary and north of a line through Springfield, Illinois, Indianapolis, Indiana and Dayton, Ohio. The southern stations include any on or to the south of this line. Except for Omaha, Nebraska, all stations are located in Ohio, Indiana, Illinois, Iowa and Missouri.

Most of the intense rains occur during the warm season months. At Bethany, Missouri from 1931 to 1940, 54 per cent of the rain during June, July and August fell at intensities of 0.5 inch per hour or greater while only 3 per cent of the precipitation in December, January, and February was equal to this rate. This seasonal occurrence of intense rains is typical also for the Corn Belt as a whole as shown by the data from 21 weather stations from 1936 to 1944. In the northern Corn Belt, 87 per cent of the hours with more than 0.4 inch of rain were in the period from May to September, and only 13 per cent were in the 7 months, October to April (see Table 7). Most of the increase in hours of rainfall of this intensity in the southern as compared with the northern part of the Corn Belt is accounted for by the fact that they started to become more numerous earlier in the spring and continued later in the fall.

Table 7.-Monthly Occurrence of Intense Rains in the Northern and Southern Portions of the Corn Belt, 1936-44 Average 1/

Item	Northern Corn Belt	Southern Corn Belt	Total Corn Belt
<u>Number of hours with 0.4 inch or more rainfall</u>			
<u>Month</u>			
January.....	.01	.13	.08
February.....	.00	.09	.05
March.....	.15	.72	.48
April.....	.33	1.10	.77
May.....	1.01	1.50	1.29
June.....	2.31	2.37	2.34
July.....	1.79	1.71	1.75
August.....	1.40	1.82	1.64
September.....	1.31	1.15	1.22
October.....	.52	.89	.73
November.....	.11	.58	.38
December.....	.04	.13	.09
Total annual.....	8.98	12.19	10.82
May to September.....	7.82	8.55	8.24
October to April.....	1.16	3.64	2.58
<u>Per cent of annual hours of intense rainfall</u>			
May to September.....	87	70	76
October to April.....	13	30	24

1/ See Table 6 for definition of an intense rain and for delineation of the northern and southern parts of the Corn Belt.

WAR-TIME CHANGES IN SOIL CONSERVATION SERVICE POLICIES

The administration of soil conservation programs by governmental agencies has been beset with difficulties associated with the prosecution of the war. Rapid personnel turnover, greatly increased needs for specific kinds of crop and livestock products, and reduced research facilities have been major obstacles in meeting increased responsibilities with reduced means.

The Soil Conservation Service, like most other agencies, experienced the greatest manpower shortage it has ever known. During the war approximately 3,000 men were lost to the Armed Forces and nearly that many more to other war agencies, to private industry, and to farming enterprises. The effect of such heavy losses of personnel can be visualized by comparing these numbers with the normal size of the Soil Conservation Service during the war years - i.e., 8,000 to 10,000 full-time employees.

The shortage of personnel was even more serious than is indicated by the high percentage of turnover because most of the vacancies occurred in the technical and scientific field where the possibility of securing trained replacements from colleges and universities practically disappeared. These losses were partially offset by a tremendously stepped-up recruitment program that extended to all parts of the Service, and by a planned policy of utilizing to a greater extent the services of local aides on an intermittent and seasonal basis.

The Soil Conservation Service policy of assistance to soil conservation districts and to farmers outside of districts was changed somewhat by the war emergency. This change was in the direction of increased emphasis on those conservation practices with wide application from which short-time benefits could be realized, and with less emphasis on a long-time conservation program requiring more technical assistance. The following extracts from Soil Conservation Service Field Memorandum 1078, "Widespread Application of Conservation Practices to Further Production of Essential War Products," dated October 14, 1942, illustrates this shift in emphasis:

"Emphasis should be given to the widespread application of conservation practices that contribute the most to maintaining or increasing yields and that can be (1) applied with little or no additional use of farm labor, equipment, power, and production supplies and (2) furthered with the minimum of technical assistance in each important crop and livestock producing county or other local area in the country. To be effective during the 1943 crop season the period from the end of harvest this fall until crop planting time next spring must be utilized in this undertaking. In range areas comparable seasonal activities must be considered."

In this same memorandum are listed the following needs for assistance to farmers:

"a. Selecting land to use for cultivated crops."

"b. Selecting acres for planting to essential war crops."

"c. Establishing practices of a more complex type that require additional use of farm labor, equipment, power and production supplies and technical assistance 'on site' only when such practices 'must' be used to assure desired production and prevent undue soil wastage."

Also:

"The Service policy, as often stated, is to assist farmers and ranchers to prosecute a complete coordinated program of soil and water conservation and sound land use, treating each acre in accordance with its needs and adaptabilities. The procedures suggested above do not in any way change this principle, but on the other hand, further it by making Service assistance available to more farmers and ranchers in a manner which will mean much in meeting their war created production-conservation problems. Every activity of this Service in emergency assistance to farmers can and must contribute to the progressive attainment of long-time Service objectives."

The closing paragraph stresses that:

"The job to be done is big--conservation must offset shortages of farm labor, equipment, power and production supplies if the needed production is to be attained. We must use the technical resources of the Service in this joint effort in the way that will contribute the most to achieving this objective--adequate harvests of all needed foods, fibers and oils in 1943, produced with a minimum of soil wastage in order that equal or greater yields can be made in 1944 and for the duration."

Another change in policy which occurred during the war period (1943) was the conducting of cooperative field tests for the application of research findings. Its war emphasis was based on the need to facilitate the more immediate application of research findings on the farms and ranches of the nation. The purpose of field trials is not only to serve as a demonstration to farmers but also to modify and adapt methods that were worked out experimentally at one location to situations having somewhat different climatic and soil conditions. They must also be adapted to the farmer's equipment and methods of farm operation.

The field trial policy involves a memorandum of understanding between the State Experiment Station, State Extension Service and the State Conservationist of the Soil Conservation Service. Work plans developed under this memorandum provide for:

- a. Selection of farms for trials of research findings.
- b. Assistance to farmers in establishing trials.
- c. Evaluation of trials.

The technical guidance of experimental procedure, measurement, and interpretation of results is the responsibility of the State Experiment Stations and Soil Conservation Research. The Operations Branch assumes major responsibility in conducting the work as an aid in developing the local or district program. The Extension Service projects the findings through informational and demonstrational activities. The number of reported field trials has increased each year since their initiation. This means of proving and extending research findings will continue to receive considerable emphasis in the post-war years.

AGRICULTURAL CONSERVATION PROGRAM OF AGRICULTURAL ADJUSTMENT AGENCY

Agricultural production programs have considerable influence on the rate of achievement of conservation objectives. The limitation of acreage of intertilled crops, increase in acreage of sod crops, as well as the direct subsidy of conservation practices have their effect on the maintenance of soil resources. Also, the parity income payments in years of low income affect the farmers ability to make soil improvements.

The payments to farmers for the application of conservation practices under the Agricultural Conservation Program of the Agricultural Adjustment Agency have increased steadily throughout the war period. These payments increased from 60 million dollars in 1936 to 293 million dollars in 1944. Since parity payments have not been increased during the war and were discontinued in 1944, the percentage of total payments that consists of payments for conservation practices has increased markedly. Table 8 shows that soil and range building payments increased from 13 per cent of total payments in 1936 to 36 per cent in 1943 and to 100 per cent in 1944.

Table 8.-Payments Under Agricultural Adjustment, Agricultural Conservation, and Parity Payment Programs, 1933 to 1944 ^{1/}

Year	Payments for -				Soil and range building payments
	Soil and range building ^{2/}	Crop allotments	Parity price program	Total	Pct. of total
		Million dollars			
1944.....	294	-	-	294	100
1943.....	215	224 ^{3/}	160	599	36
1942.....	168	218	202	588	29
1941.....	124	332	197	653	19
1940.....	116	326	197	639	18
1939.....	117	380	212	709	17
1938.....	94	351	123	568	17
1937.....	91	217	-	308	30
1936.....	61	359	40	460	13
1935.....	-	467	-	467	0
1934.....	-	637	-	637	0
1933.....	-	277	-	277	0

^{1/} See Statistical Summaries of the Agricultural Conservation and Related Programs for 1943 and 1944 for further details.

^{2/} Includes payments under Naval Stores Program.

^{3/} Includes \$30,475,000 payments made with funds from Section 32, Public Law 320, 74th Congress for potatoes and truck crops.

The payment for application of liming and fertilizing materials constitutes the largest payment for any individual conservation practice. In 1943, 35 per cent of the total soil and range building payments were for this purpose, varying regionally from 7 per cent in the Western States to 89 per cent in the Northeast (see Table 9). About 26 per cent of the total conservation payments were for the seeding or utilization of green manure or cover crops. This practice payment was most important in the South with 39 per cent of total payments for this purpose.

The seeding, sodding and improvement of pastures aside from use of fertilizer was an important use of conservation payments in all regions except the Northeast. Five per cent of total payments were for the destruction of noxious plants. All other conservation practices comprised less than 5 per cent each of the total soil and range building payments in 1943.

The application of liming materials under the Agricultural Conservation Program made up over 90 per cent of the total application of these materials in the United States in 1943 and 1944. The quantity of phosphate applied under this Program made up between one-fifth and one-fourth of the total application in the same years.

Table 9.-Proportion of Soil and Range Building Payments for Specified Practices, 1943 Agricultural Conservation Program by Regions

Item	North-east	North-central	East-central	South	West	United States
<u>Millions of dollars</u>						
Total soil and range building payments.....	14.4	78.2	35.9	47.0	37.8	213.3
<u>Pct. of total soil and range building payments</u>						
<u>Conservation practice</u>						
Application of materials						
Lime.....	53.6	22.1	29.8	3.4	1.0	17.7
Phosphate.....	31.8	14.1	30.6	11.0	4.7	15.4
Potash.....	3.9	3.0	0.3	0.2	-	1.6
Gypsum.....	-	-	-	-	1.9	0.3
Total.....	89.3	39.2	60.7	14.6	7.6	35.0
Green manure and cover crops	7.9	24.6	29.3	39.1	20.5	26.5
Mulching and crop residues..	1.5	0.2	-	3.2	3.8	1.5
Protecting summer fallow....	-	1.5	-	1.9	19.2	4.3
Contour tillage.....	-	2.5	-	12.3	1.3	3.8
Terracing.....	0.1	0.1	0.5	4.4	0.2	1.1
Strip cropping.....	0.8	1.6	-	0.3	9.3	2.4
Seeding, sodding, im- proving pastures.....	-	11.4	8.4	5.8	8.2	8.5
Grazing land management.....	-	0.5	-	0.8	7.7	1.7
Wells, dams, reservoirs, springs.....	-	2.7	-	6.5	8.0	3.9
Destroying noxious plants...	-	8.0	-	3.8	5.7	5.1
Controlling channel erosion.	-	0.8	-	0.1	0.6	0.5
Miscellaneous.....	0.4	6.3	-	4.3	7.9	4.7
Total.....	100.0	100.0	100.0	100.0	100.0	100.0

Payments for individual conservation practices were much more important locally or regionally than is indicated by the national average proportion. The protection of summer fallow while comprising only 4 per cent in the national average, amounted to 19 per cent in the 13 Western States, but to more than 30 per cent in Washington, Kansas, North Dakota, Idaho and Colorado. In South Dakota, tillage for grasshopper control made up 22 per cent of the total payments for practices. In Wisconsin and Minnesota, about one-fourth of total practice payments were for the eradication of noxious plants.

Strip cropping accounted for 45 per cent of total practice payments in Montana and 25 per cent in North Dakota. In Arizona and Nevada, over 40 per cent of conservation payments were for grazing land management. Contour tillage and terracing payments amounted to 29 per cent of the total in Oklahoma and 36 per cent in Texas. About two-thirds of the total payments for these two practices in the United States were made in these two States. Greater detail concerning individual practices by States may be obtained from the "Statistical Summary of the 1943 Agricultural Conservation and Related Programs" by the Agricultural Adjustment Agency, September 1944. Data for 1944 also may be obtained from the 1944 Statistical Summary.

The volume of conservation practices carried out under the Agricultural Conservation Program on farms and ranches in the nation has increased each year since 1936. In 1944 the operators or owners of about 4,000,000 farms and ranches in the United States carried out conservation practices for which they received assistance through the Agricultural Adjustment Agency Program. This was the first program in which all funds appropriated were used to carry out conservation practices. The extent of increase in selected conservation practices carried out under the program in 1936 and 1944 is shown below.

Practice	Units	1936	1944
Application of materials:			
Ground limestone (or equivalent).....	Tons	3,621,814	23,828,309
20 pct. superphosphate (or equivalent)....	Tons	121,653	1,949,256
Green manure and cover crops.....			
Seedings of permanent pasture mixtures.....	Acres	5,773,366	22,880,479
	Acres	1,781,650	1,621,600
Erosion control and pasture improvement:			
Terracing.....	Acres	728,591	1,719,824
Contour listing or furrowing.....	Acres	1,292,776	10,360,659
Protecting summerfallow.....	Acres	3,584,913	12,323,909
Contour farming intertilled crops and contour seeding small grain crops.....	Acres	---	17,987,177
Strip cropping and strip fallowing.....	Acres	---	6,533,130
Earthen dams and reservoirs.....	Cu.yd.	5,230,151	127,272,428
Reseeding of pastures and range land:			
Natural (by deferred grazing).....	Acres	36,847	6,301,650
Grazing management.....	Acres	---	79,780,180
Artificial reseeding.....	1,000 lbs. of seed	---	30,377

POSTWAR PROSPECTS FOR SOIL AND WATER CONSERVATION

Needed Land Use Changes and Effects on Production.—The prospects are bright that rates of soil loss in the postwar period will be considerably reduced. In a study of postwar production possibilities under the leadership of the Bureau of Agricultural Economics, the State Production Adjustment Committees have suggested the changes in use of cropland indicated in Table 10. These estimates were made with the assumption of full employment and with considerable emphasis on the maintenance of soil resources. While the suggested total cropland is only 2 per cent below that used in 1943, an acreage of intertilled crops even lower than in the prewar period of 1935 to 1939 is suggested.

Table 10.—Suggested Postwar Use of Cropland Under Conditions of General Prosperity and Maintenance of Soil Resources, State Production Adjustment Committees

Region <u>1/</u>	Intertilled	Close growing	Hay and rotation pasture <u>2/</u>	Summer fallow and idle	Total cropland
			<u>Per cent of 1943</u>		
Northeast.....	101	96	98	95	98
Lake States.....	93	86	125	84	100
Corn Belt.....	83	113	120	85	99
Appalachian.....	91	123	111	27	93
Southeast.....	97	143	132	53	99
Mississippi Delta.	95	153	125	49	97
Southern Plains...	94	124	110	85	100
Northern Plains...	100	95	140	85	98
Mountain States...	94	97	114	100	101
Pacific States....	90	92	120	95	98
United States.....	92	102	118	81	98

1/ See Table 1 for States included in geographic regions.

2/ All tame hay except soybean, cowpea, peanut and small grain.

A need for an 18 per cent increase in hay and rotation pasture (exclusive of soybean and cowpea hay) was indicated. This is in addition to the 7 per cent increase which took place during the war period. Except in the Northeast Region, the recommended increases in hay and rotation pasture varied from 10 to 40 per cent for different parts of the country.

While the recommended postwar acreage of close-growing crops, consisting largely of small grains, showed only 2 per cent increase for the United States as a whole rather wide regional variations existed. In the Southeast and Delta States, recommendations were made for 40 to 50 per cent increases in acreage of close-growing crops. Considerable increases also were indicated for the Southern Plains, Appalachian, and Corn Belt Regions. Reductions in acreage of close-growing crops would be of significance in the Northern Great Plains, Pacific and Mountain States and the Lake States.

Suggested land-use changes for stability in agriculture within a state are spelled out by the Illinois production capacity committee in terms of acreage and production in 1950 under several assumptions with respect to employment and national income. With a moderate level of national income with about 7 million unemployed, a so-called "probable" situation consistent with respect to food needs and a permanent type of agriculture contemplates the following acreage shifts in the postwar period:

Land use	1943	"Probable" 1950	Change
	Thousand acres		Per cent
Corn.....	8,621	8,000	- 7
Soybeans.....	4,033	3,140	-22
Other intertilled crops.....	526	550	+ 5
Total intertilled crops.....	13,180	11,690	-11
Small grain.....	4,808	5,200	+ 8
Hay other than soybean and cowpea....	2,010	2,250	+12
Rotation pasture.....	3,100	4,030	+30
Idle, fallow and failure.....	1,784	1,407	-21
Total cropland.....	24,882	24,577	- 1
Permanent pasture including grazed woodland.....	4,230	3,100	-27
Woodland and other land.....	2,440	3,625	+48
Total land in farms.....	31,552	31,302	- 1

Aside from the conservation needs for changed land use in the post-war period, extensive changes in cropping practices within a specified pattern of land use also are needed. The extent of needs for increased use of conservation practices is more impressive when compared with the present use of many of these practices. The extent of a selected list of conservation practices needed for a permanent agriculture in Illinois in comparison with the extent of application in 1943 was estimated as follows:

Item	Unit	1943	Needed
Contour tillage.....	Thousand acres	179	6,000
Terracing.....	" "	23	3,000
Strip cropping.....	" "	12	1,500
Additional drainage.....	" "	-	1,924
Lime application.....	" "	1,209	26,882
Phosphate application.....	" "	442	- *
Rock phosphate equivalent.....	Thousand tons	- *	12,000
Muriate of potash.....	" "	- *	2,126
Area of woodland.....	Thousand acres	3,062	3,250
Woodland protected from fire.....	" "	2,586	3,250
Woodland protected from grazing.....	" "	927	2,150
Good cutting practices on woodland...	" "	563	3,250

*Not reported.

The effect of changed land use and increased use of conservation practices will have considerable influence on the kinds and quantities of agricultural production. While the Illinois committee used a very modest assumption of extent of use of conservation practices by 1950 (28 per cent as compared with 20 per cent in 1943), it was estimated that a very significant increase in yield per acre could be achieved by their application in the post-war period. Increased yield per acre in 1950 as compared with the 1936-42 average (aside from weather influence) would amount to 9 per cent in the case of corn and wheat, 5 per cent for oats and hay and 1 per cent for soybeans. This effect of increased yield per acre would modify the effect of acreage changes on production in 1950 as shown below. A more ambitious assumption with regard to national income would accentuate most of the trends indicated as "probable."

Crop	Per cent change in 1950 from 1943	
	Acreage	Production
Corn.....	- 7	+ 1
Soybeans.....	- 22	- 20
Small grain.....	+ 8	+ 15
All tame hay.....	+ 4	+ 9
All pasture.....	- 2	+ 11

Conservation Needs in the United States.-The Soil Conservation Service has made a national estimate of specific soil and water conservation needs by States.^{1/} This will gradually become available by smaller and more significant geographic divisions, such as soil resource areas and soil conservation districts. Table 11 shows a selected list of these needs together with an estimated utilization of labor, equipment, and seed required for the application of conservation practices.

^{1/} Soil and Water Conservation Needs Estimates for the United States, USDA Mimeographed, June 1945.

Table 11.-Selected Conservation Needs on Land in Farms in the United States, Extent of Practices, and Amounts of Labor, Equipment, and Materials Needed in Their Application, 1943

Land use and conservation practice	Unit	Extent of needs	Labor needed in application
		Thousands	Man years
Cropland - 418 million acres in 1939			
Contour planting.....	Acres	124,694	10,253
Cover crops.....	"	34,120	18,369
Crop residue management.....	"	178,243	8,389
Crop rotation.....	"	212,780	6,558
Green manure crops.....	"	55,346	69,543
Perennial hay crops.....	"	11,062	41,981
Rotation hay or pasture.....	"	90,838	48,435
Strip cropping.....	"	96,465	29,255
Terracing.....	"	90,658	277,496
Grazing land - 474 million acres			
Contour furrowing.....	Acres	13,377	15,112
Deferred grazing.....	"	253,842	2,184
Fertilizing grazing land.....	"	109,019	21,366
Liming pastures.....	"	84,488	24,854
Maintaining forage reserves.....	"	87,486	—
Mowing grazing land.....	"	111,272	27,603
Proper stocking.....	"	358,820	1,117
Seeding range and pastures.....	"	110,582	82,092
Stockwater developments.....	Number	1,202	81,358
Woodland - 115 million acres			
Field and gully planting.....	Acres	11,655	145,244
Harvest cutting.....	"	42,373	275,287
Improvement cuttings.....	"	85,749	919,497
Prevention of grazing damage.....	"	104,298	63,249
Other land or mixed uses			
Clearing and grubbing.....	Acres	25,066	548,131
Drainage.....	"	19,546	166,076
Outlets and farm water courses.....	"	6,291	131,253
Soil saving dams.....	Number	333	163,504
Unlisted conservation practices.....			456,626
Total labor for establishment...			3,634,932
Use of motor equipment.....	Years		327,441
Use of horse equipment.....	"		1,089,978
Seed.....	Tons		2,544,106

This estimate of needs assumes an adequate degree of changed land use to control erosion. It is an estimate of the total need for the initial application of practices. This total would be increased by the need for recurrent applications. While soil loss would not be eliminated by meeting the listed needs, it would be brought within the range of practical control. While the estimate is admittedly tentative, and subject to modification as more information becomes available, the estimated 3.6 million man years of labor, 1.4 million years use of motor and horse equipment, and 2.5 million tons of seed to complete the establishment of practices gives some idea of the magnitude of the job. It does not include the technical assistance and educational effort needed to complete the task.

Soil Conservation District Organization and Development.--Even the present number of organized Soil Conservation Districts indicate a large potentiality for increased application of conservation practices after the war. Table 12 shows that the 1,346 Districts in 45 States ^{1/} having legislative enabling acts include about 3 million farm operating units and 740 million acres of land. The average District includes a little more than one-half million acres of land and something over 2,000 farm operating units.

1/ Two additional States have passed Soil Conservation District enabling acts since June 1945.

While the size of District varies considerably by States and Regions according to differences in pattern of organization, the modal sizes in most Regions are from 200 to 500 thousand acres in area and from 1,000 to 2,000 farm operating units per District. Table 13 shows how the average size of District varies by States by each of these measures. Figure 1 shows graphically the increase in extent of coverage of Soil Conservation Districts from September 15, 1939 to December 15, 1944.

The experience of the last eight years of operation of Soil Conservation Districts gives considerable basis for optimism that rapid progress may be made in the achievement of conservation goals. While the responsibilities of administering a locally adapted program of soil and water conservation were new to most District Supervisors, they have been very effective in a large proportion of instances. This is brought out in a study of the administration of 69 Soil Conservation Districts in 19 states by the Extension Service and the Soil Conservation Service in 1944. 2/

2/ Aspects of Administration of Soil Conservation Districts, USDA, Mimeographed, August 1945.

Over 80 per cent of the District governing bodies were "fairly" or "very" active in planning and conducting meetings of the governing body, handling finances, obtaining assistance in the development of the work plan, and in determining the acceptability of individual farm conservation plans. A slightly lower proportion were active in the preparation of annual reports, participation in information work, and the routing and use of equipment. They were least active (40 to 60 per cent "fairly" active) in determining priorities of planning work, developing farmer group activity, finding and guiding local leaders and in determining the form of the farm plan.

Attitudes of District governing bodies toward their responsibilities and the potentialities of this governmental subdivision in facilitating the application of soil and water conservation practices are illustrated by the following statements from the above report:

"The conception of governing bodies of Soil Conservation Districts as to their responsibilities varies widely. At one extreme they consider themselves simply advisory bodies to agency representatives. At the other, they believe they are administrators of soil and water conservation work who should initiate and direct all such work in their Districts.

"District governing bodies are capable of assuming greater responsibilities in soil conservation. After the war, when materials and labor are more plentiful, they will expand their conservation activities.

"The total effort of agencies and organizations assisting and cooperating with Soil Conservation Districts is a vital force in conserving soil and water resources. Only a portion of the help they make available has yet been used."

The organization of Soil Conservation Districts represents only a potentiality for answering the problems of soil and water loss in a community. The Soil Conservation District provides a means for attacking those problems that are beyond the power and ability of the individual working alone. It furnishes the focal point at which farmers and ranchers can cooperate in solving their mutual problems as well as a point at which technical and other assistance of governmental agencies may be applied in the solution of these problems. The rapid spread of District organization and the local acceptance of responsibility in their administration augurs well for future progress in the achievement of soil conservation objectives.

Table 12.-Number of Soil Conservation Districts, Total Acreage, and Number of Farm Operating Units, by Regions, June 15, 1945 1/

Item	Region -							United States
	I North-east	II South-east	III Upper Mis-sis-sippi	IV West-ern Gulf	V North-ern Great Plains	VI South-west	VII Pa-cific Coast	
Soil Conservation Districts, number.....	85	262	269	237	237	157	99	1,346
Total area of Districts, million acres.....	46	186	87	178	116	90	37	740
Farm operating units in Districts <u>2/</u> , thousands.....	218	1,266	576	685	242	58	53	3,066
Area per District, thousand acres.....	547	708	322	752	491	575	377	550
Farm operating units per District <u>2/</u>	2,568	4,834	2,141	2,890	1,022	373	587	2,278
Per cent of Soil Conservation Districts								
Size of Districts								
Acres per District:								
Less than 50,000.....	-	-	1	-	1	18	22	4
50,000 to 199,000.....	8	15	16	4	13	19	32	14
200,000 to 499,000.....	55	43	74	23	51	29	25	45
500,000 to 999,000.....	26	17	9	50	27	14	13	23
1,000,000 to 1,999,000....	7	18	-	22	7	15	6	11
2,000,000 and over.....	4	7	-	1	1	5	2	3
Farm operating units per District:								
Less than 100.....	-	1	-	1	8	21	20	5
100 to 499.....	4	1	3	4	23	59	44	16
500 to 999.....	10	8	9	10	28	11	19	14
1,000 to 1,999.....	31	26	37	30	27	7	13	26
2,000 to 2,999.....	25	21	35	16	12	2	1	16
3,000 to 4,999.....	20	14	15	24	2	-	3	12
5,000 to 9,999.....	10	13	1	15	-	-	-	6
10,000 and over.....	-	16	-	-	-	-	-	3

1/ Includes 18 Montana Grass Conservation Districts.
2/ Based on 97 per cent of the Districts which reported number of farm operating units.

June 1945

June 1945

-  States having a Soil Conservation Districts Law
 Soil Conservation Districts

Table 13.-Soil Conservation Districts, Acreage and Number of Farm Operating Units Per District, by States, June 15, 1945

State	No. of Soil Conser- vation Dists.	Per District		State	No. of Soil Conser- vation Dists.	Per District	
		Thou- sand acres	Farm oper- ating units			Thou- sand acres	Farm oper- ating units
Delaware.....	3	422	2,867	Arkansas.....	42	559	2,888
Maine.....	8	1,257	2,197	Louisiana.....	17	1,145	5,318
Maryland.....	18	274	1,855	Oklahoma.....	66	530	2,112
New Jersey.....	4	907	5,136	Texas.....	112	896	2,988
New York.....	25	458	2,478				
Pennsylvania.....	6	229	1,806	Region IV....	237	752	2,890
Rhode Island.....	3	226	662				
Vermont.....	5	510	2,068	Kansas.....	49	490	1,645
West Virginia....	13	810	4,021	Montana.....	41	609	304
				Nebraska.....	58	412	1,391
Region I.....	85	547	2,568	North Dakota....	39	453	809
				South Dakota....	37	380	879
Alabama.....	12	2,724	17,271	Wyoming.....	13	905	290
Florida.....	31	533	1,154				
Georgia.....	24	1,282	8,274	Region V.....	237	491	1,022
Kentucky.....	56	213	1,970				
Mississippi.....	51	433	2,166	Arizona.....	21	12	133
North Carolina...	20	1,267	11,723	Colorado.....	55	301	279
South Carolina...	21	932	6,950	New Mexico.....	48	787	499
Tennessee.....	28	265	2,540	Utah.....	33	1,082	504
Virginia.....	19	1,009	6,113				
				Region VI....	157	575	373
Region II....	262	708	4,834				
				California.....	38	100	491
Illinois.....	58	312	1,932	Idaho.....	14	584	766
Indiana.....	22	173	1,404	Nevada.....	9	1,309	107
Iowa.....	55	332	2,033	Oregon.....	10	176	122
Michigan.....	24	249	1,660	Washington.....	28	424	931
Minnesota.....	26	277	1,587				
Missouri.....	14	359	2,319	Region VII...	99	377	587
Ohio.....	32	281	2,603				
Wisconsin.....	38	507	3,265				
				UNITED STATES..	1,346	550	2,278
Region III...	269	322	2,141				

SUMMARY

The more intensive use of cropland for intertilled crops during the war has increased the rate of soil loss to a greater extent than it has been reduced by the increased use of soil and water conservation practices.

Soil losses due to changed land use during the war were much less than during World War I.

More intense rains occurred in the most important production areas than in the five years previous to the war.

The amount expended and the proportion of total payments to farmers by the Agricultural Adjustment Agency for the application of conservation practices has increased steadily throughout the war period.

The payments for application of liming and fertilizer materials and for green manure or cover crops constituted 61 per cent of the total payments for conservation practices in 1943. The application of materials under the Agricultural Conservation Program amounted to more than 90 per cent of the total limestone and between 20 and 25 per cent of the total phosphate used on farms.

Meeting the conservation needs on land in farms in the United States will require 3.6 million man-years of labor, 1.4 million years use of motor and horse equipment and 2.5 million tons of seed in the establishment of conservation practices.

In Illinois, a modest increase in use of conservation practices, together with suggested changes in land use which include a 11 per cent decrease in intertilled crops, would maintain corn production, increase the production of small grain by 15 per cent, increase pasture and hay production by 10 per cent and decrease only the production of soybeans.

The number of organized Soil Conservation Districts has increased by seven times since 1939 and in June 1945 included an area of 740 million acres.

The average Soil Conservation District covers about one-half million acres and something over 2,000 farm operating units.

Soil Conservation District governing bodies have made considerable progress in discharging the responsibilities of the local administration of a soil conservation program.